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ABSTRACT

This paper suggests that many adult learners lack the skill of reading and writing larger numbers. Two Ovid computer searches of the ERIC (Educational Resources and Information Center) database are used to provide the background research. Issues in and teaching methods of reading and writing larger numbers, particularly a language-symbol approach, are discussed. The paper finds that place value concepts are not essential to reading and writing numbers, and difficulty with those concepts should not prevent acquisition of reading and writing larger numbers in the hundreds of thousands, millions, and billions. Anyone who correctly reads and writes all of the numbers 0 to 999 can quickly and easily build on those skills to master numbers in the billions and trillions. (ASK)

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On numerous occasions in teaching Special Education, ESL, GED preparation, and Remedial Math, the author of this article has found learners lacking the skills of reading and writing larger numbers. Many older children and adult learners withdrew from, or otherwise opposed, instruction or remediation that involved manipulables. Also, place-value explanations at times seemed to compound misconceptions. Instruction in place value is often used to introduce reading and writing of larger numbers. However, place value concepts are not essential to reading and writing numbers, and difficulties with those concepts need not prevent acquisition of the practical vocational skills of reading and writing larger numbers in the hundreds of thousands, millions, and billions. The author has found that removing the issue from the domain of conceptual mathematics and treating it as a language-symbol problem can yield quick and lasting results. Moreover, the indications are that anyone who correctly reads and writes all of the numbers 0 to 999 can quickly and easily build on those skills to master numbers into billions and trillions.

Two Ovid computer searches of ERIC provided the background research for this article. Both were keyed to the terms "number$" and "place value." One search covered 1965 to 1984. The other covered 1985 to March 2000. The searches yielded a total of 270 citations, all of which were reviewed. Of those, six were selected for consultation of the full documents; four documents actually treated with the reading and/or writing of larger numbers. Morgenstern and Pincus (1972) maintained a "lack of any organizing principle" in errors of elementary school students. Closer examination, however, might have revealed that each student's errors were consistent (and therefore systematic), though idiosyncratic. Finkelstein (1980), in a text purportedly developed for use by slow learners and students with learning disabilities in high school, instructed learners to read the comma in a larger number as "thousand," but made no mention of millions and billions, nor did he address zeroes, either singly or in clusters. Cooper (1994) did not deal with zeroes, either, though he did observe the repeating pattern in three-digit clusters. He did designate commas as "trillion," billion," "million," and "thousand" without saying so explicitly. Shea and Capleton (1984) designated the three-digit clusters between commas as "periods," and instructed that "when we get to the comma, we say the period name." Once again, however, zeroes went unaddressed, and instruction could be much more expeditious without introducing the concept of periods within a number. For many learners, adding this element to instruction could lead to more bewilderment than clarification.

The teacher must always be mindful of the age-appropriateness of any instructional material or technique, along with pragmatic considerations of availability, cost, and ease of implementation. These four factors make chalkboard instruction, with paper-and-pencil practice, particularly appealing, as long as the technique is efficient and effective. The

technique described below adheres to these four contingencies while assuring that no gaps are left by leaving information to the learners' inference.

This technique presupposes mastery of the skills of reading and writing the numbers zero to 999. It also treats the reading of zeroes and clusters of zeroes as discrete skills. Consequently, instruction on zeroes will be explained separately below, so only the digits 1 through 9 are used in instruction until learners achieve mastery of all numbers up to 999,999,999,999 without zeroes.

When mastery of numbers up to 999 has been established, write a four-digit number on the board, and separate the hundred's place from the thousand's place by a comma. Teach the students that the comma represents the word "thousand," and as they read the number, they are to say the word "thousand" when they arrive at the comma. An easy way to illustrate and cue this is by writing the word "thousand" under the comma:

4 , 7 3 5
t
h
o
u
s
a
n
d

As the students develop this as an automatic response, introduce 5- and 6-digit numbers. In order to focus learner attention on the digits in the thousand's cluster, cover the comma and the digits to the right of it. After they have read the digits in the thousands period, uncover the comma, at which they are to say "thousand," then uncover the final 3-digit cluster for them to read. The skill of writing the numbers up to 999,999 should be introduced as soon as reading them is mastered. This is accomplished by instructing the students to write a comma whenever they hear the word "thousand" as numbers are read aloud. After mastery to 999,999, introduce a 7-digit number with a comma to the right of the million's place. Teach that this new comma represents the word "million." Once again, illustration and cueing can be accomplished by writing vertically:

6 , 2 3 1 , 7 5 9
m
i
l
l
i
o
n

If necessary, cover all of the digits and commas that you do not want the learners to attend to, gradually revealing the commas and 3-digit clusters as they read through the elements of the number. At this point, teach learners to write " , _ _ _ , _ _ _ " as soon as they hear the word "million." These blank spaces provide a visible physical structure on which to fasten the subsequent auditory in-put. (This will also greatly facilitate later instruction in how to respond to clusters of 3 zeroes between commas.) When reading mastery is established in numbers to 9,999,999, introduce tens of millions, then follow with hundreds of millions. After reading is internalized, follow with instruction in writing skills. On mastery of numbers up to 999,999,999, extend the same technique to teaching billions, tens of billions, and hundreds of billions.

On mastery of hundreds of billions, introduce zeroes. (In the author's experience, the above learning sequence progresses much more rapidly than that which follows.) Point out that since zero means "nothing," we do not say anything when we encounter zeroes. For instance, in the number 7,023 the zero means that we do not say the word "hundred" in the cluster where it occurs.

In a separate lesson, teach that the occurrence of three zeroes between two commas means that the name of the comma to the right is silent. For example, 23,000,417 is read "twenty-three million four hundred fifteen." For some learners, it might be necessary to augment the auditory in-put with visual by covering the mouth with a hand. For some learners it will be entirely appropriate to include instruction on how to write numbers that have two or more cluster of zeroes, depending upon vocational goals.

As the successive reading and writing skills are mastered, the teacher must integrate them into math, reading, writing, and content-area instruction. The author (teaching adults in a state that offers major lottery jackpots) has found that learners can compare jackpot amounts and also read and write the amount awarded to each member of a group purchasing a winning ticket. Government expenditures and budget deficits are also ready and current discussion topics into which to integrate these numeric skills.

In the course of this instructional sequence, learners are exposed to new language phenomena. The author has found that instruction and explanations are most effective when delivered in the learners' own terms. Therefore, it is advisable to let the learners name these phenomena themselves out of their own experiences and vocabularies if they choose to do so. If learners are not forthcoming with these names, then alternatively the instructor can offer names that relate to some shared experience of the group.

The author has used the above-described technique with learners of a wide range of ages and cognitive levels and in a variety of settings. It is demonstrably an efficient and effective instructional device for meeting short-term practical learner-centered goals.

However, research could reveal it to be a mechanism for acquiring skills that could lead to successful conceptualization of place value. Perhaps conventional practice places the cart before the horse in teaching place value as an entry behavior for numeric literacy when, in fact, learners should be using these practical reading and writing skills as a foundation on which to build concepts of place value. This would conform with the basic pedagogical principle of movement from the concrete to the abstract.

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